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To Ken Green (Sen) | From Jim Stefanoff
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Phone # | Phone #
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October 5, 1999

Mark Henry
Jim Stefanoff
CH2M HILL, Inc.
9 South Washington, Suite 400
Spokane, WA 99204

Three-page FAX

Dear Mark and Jim:

The purpose of this letter is to provide you with my ideas relative to the design and construction of test wells within the Milo Creek drainage near Kellogg. The plan to drill and monitor test wells in the Milo Creek drainage was developed during the September 29-30, 1999 meeting in Spokane.

Purpose and Objectives of the Test Wells

The purpose of the test wells is to better define the cone of depression created by the underground workings of the Bunker Hill Mine. The objectives are: 1) to document the presence or absence of shallow ground water systems at selected sites within the West Fork Milo Creek drainage and possibly within the Main Fork Milo drainage and 2) to provide the opportunity to measure ground water levels at various locations and depths in response to both recharge events and installation of water diversion measures. The wells would be drilled using air rotary drilling techniques in order to identify water-producing zones. A minimum of two piezometers would be completed in each drilled hole with appropriate seals placed within the borehole to isolate monitored intervals.

Design and Construction of the Test Wells

The following steps would be involved in the construction of the test wells with multiple piezometer completions.

1. A tractor would be used to construct rough roads to the selected drilling sites. The locations of potential drilling sites would be determined during a prior site visit. The tractor would be used to make drilling pads.

2. The drilling rig would be mobilized to the first drilling site. The tractor probably would remain on site during the drilling activity to aid in moving the drilling rig.

3. A temporary surface casing would be placed through the alluvium if needed. The casing would need to be large enough to allow construction of a 6-inch diameter open borehole.

4. The well would be drilled open hole to a maximum depth of 200 feet. The depth of each well would be determined on site by a field geologist. Individual water producing zones would be identified during drilling. A general geologic log would be formulated based on drill cuttings.

5. A minimum of two piezometers would be completed in the 6-inch diameter borehole. The piezometers would consist of one-inch diameter, screw coupled PVC casing with 10 or 20-foot screened sections. Silica sand would be placed opposite the screened sections with the remainder of the hole filled with bentonite. The field geologist would select the locations for the screened sections. The surface completion would include a surface casing cemented in place, a locking well cap and three protective posts cemented in place.

6. The construction plan described above would be followed for each well. The project includes construction of an estimated six wells, depending on cost.

Location of the Test Wells

I believe that four to five of the test wells should be located in the West Fork Milo Creek drainage with one to two wells located in the Main Milo Creek drainage. Suggested locations for the wells are noted below. The actual well locations would be located in the field before and during the drilling program.

1. The first well should be located up-gradient of the Katherine Fault within the West Fork Milo Creek drainage near the present stream channel.

2. The second well should be drilled above the first well if a downward hydraulic gradient is found in the first well. The well spacing should be approximately 200 feet. The intent of this well would be to locate the western extent of the cone of depression created by the mine.

3. Alternatively, the second well would be drilled below the Katherine Fault if the first well does not show a downward hydraulic gradient. The well spacing would be 100 to 200 feet. The purpose of this well would be to document the effect of the Katherine Fault on ground water flow in the area.

4. The third well would be drilled approximately 200 to 300 feet north-northeast of the first well at approximately the same elevation. This well would provide information on ground water conditions on the hill slope above the caving area.

5. The fourth well would be drilled roughly half way between the Katherine fault and the Phil Sheridan raises. The purpose of this well would be to document the effectiveness of surface water diversion systems.

6. As one alternative, the fifth well could be drilled within the West Fork drainage approximately 100 feet down gradient from the Phil Sheridan raises. The purpose of this well would be to determine the ground water recharge that occurs in this portion of the drainage and the combined effectiveness of the diversion dam and the raises.

7. Alternatively, the fifth well could be drilled near the road immediately up-gradient of the existing diversion dam on Milo Creek. The purpose of this well would be to determine the well loss characteristics for this portion of the stream. This would be the location of the sixth well if the fifth well is drilled in the West Milo drainage.

8. Alternatively, the sixth well would be drilled at a location about 300 feet up-gradient from the existing diversion dam on Milo Creek. The purpose of this well would be to determine the extent of the cone of depression created by the mine in this area.

I recommend that data loggers be used in selected wells to provide long-term water level records. A data logger also could be installed on a constricted section of West Milo Creek to provide stream stage information. I believe that the 3001 Levelogger by Solinst (1-800-661-2023) and the WL14 water level logger by Global Water (1-800-876-1172) are both small enough to fit in one-inch diameter PVC casing.

Please contact me if you have any questions relative to the ideas presented within this letter. I would appreciate the opportunity to review the draft specifications and bid sheet for the drilling program if possible. Thank you.

Sincerely,

Dale R. Ralston

Cc: Mike Fitzgerald, TerraGraphics Environmental Engineering